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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/519,408	03/03/00	NAKAMURA	T 3905

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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/519,408	Applicant(s) NAKAMURA ET AL.	
	Examiner Wai-Sing Louie	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If the period for reply specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-15 is/are pending in the application.

4a) Of the above claim(s) 8-15 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-7 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15)☒ Notice of References Cited (PTO-892)

16)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

17)☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

18)☒ Interview Summary (PTO-413) Paper No(s). 3,4,5 .

19)☐ Notice of Informal Patent Application (PTO-152)

20)☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-7, drawn to semiconductor device, classified in class 257, subclass 79.

II. Claims 8-18, drawn to method of manufacturing the device, classified in class 438, subclass 22.

The inventions are distinct, each from the other because of the following reasons:

Inventions Group I and Group II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, instead of growing a transparent conductor film, it would be sputtered on top of the p-electrode.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

2. During a telephone conversation with Mr. Walter Fasse on 3/19/01 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-7. Affirmation of this election must be made by applicant in replying to this Office action. Claims 8-15 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Objections

3. Claim 5 is objected to because of the following informalities:

In claim 5, line 4, "the surface of said upper is flattened.", but the specification discloses "the lower layer is flattened". For the purpose of examination, "the lower surface is flattened" is assumed. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 2-4 and 7 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

a. In claim 2, line 3, an "n-type transparent conductor film" is claimed, which is formed on the gold thin film. When an n-type semiconductor layer is placed on top of a

p-type semiconductor layer, the n-type layer becomes a current blocking layer, which is not conductive. Please explain how light can be emitted through this layer? The disclosed Japanese Patent No. 6-318406 does not disclose the In_2O_3/ZnO is an n-type semiconductor.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

5. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. In claim 5, line 5, it is unclear what is meant by "irregularized"? For the purpose of examination, "unpolished" is assumed.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Ishibashi et al. (US 5,617,446).

With regard to claim 1, Ishibashi et al. disclose a semiconductor light-emitting device (col. 3, line 8 to col. 9, line 58 and fig. 2) comprising:

- A substrate 1 provided with an n-type lower electrode on the back surface;
- A light-emitting layer 6 provided on the substrate;
- A p-type semiconductor layer 7 provided on the light-emitting layer;
- An upper electrode has a multiplayer structure consisting of at least two heterogeneous layers 13 and 14.

With regard to claim 6, Ishibashi et al. disclose the substrate includes a ZnSe single-crystalline substrate (col. 9, lines 34-39), and the p-type semiconductor layer includes a ZnSe semiconductor layer 10 (col. 3, lines 24-25).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2-5 (in so far as they are understood) are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibashi et al. (US 5,617,446) in view of Kazuyoshi et al. (JP 06-318406).

With regard to claim 2, Ishibashi et al. disclose the upper electrode includes an Au thin film 14 coming into contact with the p-type semiconductor layer, but Ishibashi et al. do not disclose an n-type transparent conductor film formed on the Au thin film. However, Kazuyoshi et al. disclose al. ITO type transparent conductive layer, which is made of In and Zn compound.

Kazuyoshi et al. teach that this compound is transparent, conductive, resistant to heat and high humidity, and is suitable to be a transparent electrode (page 3, paragraph [0018]). Hence, it would have been obvious at the time the invention was made to use Kazuyoshi's InO/ZnO layer in Ishibashi's device. Kazuyoshi et al. do not disclose the layer is n-type. However, one with ordinary skill in the art would dope the layer with impurity to increase the conductivity of the layer.

With regard to claim 3, Ishibashi et al. do not disclose the thickness of the Au thin film. However, the temperature, power, time and thickness of claim 3 is considered to involve routine optimization which has been held to be within the level of ordinary skill in the art. As noted in In re Aller, the selection of reaction parameters such as temperature and concentration, thickness etc. would have been obvious:

"Normally, it is to be expected that a change in temperature, or in thickness , or in time, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art...such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

Therefore, one of ordinary skill in the requisite art at the time the invention was made would have used any temperature, power, thickness, and time range suitable to the method in process in order to optimize the design.

With regard to claim 4, Ishibashi et al. modified by Kazuyoshi et al. in claim 2 above would have an In_2O_3/ZnO layer on top of the Au thin layer. Kazuyoshi et al. only disclose an 0.55-0.8 In_2O_3/ZnO layer, however, Kazuyoshi et al. teach the In_2O_3/ZnO compound used as a transparent base material, requires at least 70% or more In_2O_3 compound and more desirable to have 90% or more for light transmittance (page 3, paragraph [0014]). Therefore, it would have been obvious to one with ordinary skill in the art to have an In_2O_3-10wt.% ZnO for a better light-transmitting layer.

With regard to claim 5, Ishibashi et al. modified by Kazuyoshi et al. would have a multiplayer structure upper electrode. However, they do not disclose the surface of the lower layer is flattened and the surface of the upper layer is unpolished. It would have been obvious the lower layer is deposited on a semiconductor surface, which is polished, and the upper surface is sputtered on as suggested by Kazuyoshi (page 4, paragraph [0023]). The sputtering forms a uniform surface and not need polishing.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibashi et al. (US 5,617,446) modified by Kazuyoshi et al. (JP 06-318406) as applied to claim 2 above, and further in view of Mei et al. (US 6,107,641)

With regard to claim 7, Ishibashi et al. modified by Kazuyoshi et al. would have an In_2O_3-10wt.% ZnO layer, but they do not disclose the In_2O_3-10wt.% ZnO layer is formed by laser ablation. Mei et al. disclose laser ablation technique. Mei et al teach using laser ablation to generate relatively energetic dopant atoms directly into the layer (Mei col. 6, line 62 to col. 7,

line 12). Hence, it would have been obvious to one with ordinary skill in the art to deposit the In_2O_3-10wt.% ZnO layer and add dopant into the layer to eliminate a processing step.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (703) 305-0474. The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

wsl
May 22, 2001

Olik Chaudhuri
Supervisory Patent Examiner
Technology Center 2800